APPENDIX E

Application for Provisional Patent

TITLE:
ENHANCED WIRELESS ADAPTIVE POWER PROVISIONING SYSTEM FOR SMALL DEVICES

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CROSS-REFERENCES TO RELATED APPLICATIONS:

COUPLER WITH THREE DEGREES OF FREEDOM
AN AUTOMATIC AND ADAPTIVE POWER SUPPLY
WIRELESS ADAPTIVE POWER PROVISIONING SYSTEM FOR SMALL DEVICES

BACKGROUND FIELD OF INVENTION: Currently, a variety of mobile and portable devices, including laptop and portable computers, mobile telephones, pagers, personal digital assistants and other electronic devices must be connected to external electrical power sources that provide electrical power to the devices themselves, or, to recharge internal batteries of such devices, namely re-chargers. Access to these power sources, typically a plug-in cable, restrict the locations and mobility of such devices.

Known to the inventor is copending application titled "CONDUCTIVE COUPLER WITH THREE DEGREES OF FREEDOM " describing a multi-contact coupling system and application titled "AN AUTOMATIC AND ADAPTIVE POWER SUPPLY" describing a multi contact smart power supply.

What is clearly needed, is a better way to allow portable devices to be charged, without requiring plugging in a cable, cradle etc.. that would inhibit their use to some degree while charging.

In some cases, even some of the ways to charge portable devices as described above may have some practical shortcomings. For example, in cases known to the inventors there is a requirement that each conductive section be turned on or off, and the number of sections, in actual practice, is often limited, due to the relatively high cost of switching the sections actively on or off.

For example, even though the technology known to the inventors covers a situation where you could have a thousand sections with a fine resolution, allowing the use of small devices such as key chains, cell phones, ear pieces, etc., which increasingly are smaller and smaller, the cost of such a system, with today's component costs, might be too high for mass consumers.

What is clearly needed is an alternative approach that allows delivery of the same functionality in a smaller geometry space, without increasing the cost of the switches (too many) to a point where the system becomes too expensive.

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Further to the options discussed above, there are new ways and means of implementing essentially the same novel art with nonconductive surfaces. What is clearly needed are an apparatus and a method that allow the implementation of the above-described goal, using nonconductive surfaces, or additional enhancements for easier control, better performance, etc., when using conductive surfaces.

Description of the preferred embodiment

Connecting

The invention describes an electrical coupling system ("CS") that allows the closing of an electrical circuit between two bodies, each with a surface that contains an electrical conductive area. The CS provides three degrees of freedom between the two surfaces, two as a linear movement or offset in the X and Y axis of a plane essentially co-planar to the larger of the bodies, and the third is a rotation around the Z axis perpendicular to that plane. Figure 1 shows a simplified isometric view of a CS consisting out of the conductive are marked "BASE" in the base unit, that is typically stationary, and a second conductive area marked "Adapter". Also shown for orientation is the above mentioned coordinate system, and wires marked "wires (adapter side)" and "wires (base side)", respectively. Those conductive areas may either be attached to the bodies, or in a preferably integrated into the body structure. This allows a circuit to be closed, with out requiring alignment, as is typically required by connectors, cradles etc.

In one instance, the Coupler may be used to power a laptop computers or other Devices that are placed freely on an energizing desktop or other surface forming the base. The desk or surface acts as one side of the coupler and the bottom of the Device acts as the second side. A power supply is connected to the active part of the desk or surface (such as a desk pad, writing pad etc.) and can close an electrical circuit with the active area of the device placed upon, allowing a charging circuit of the Device independent of the position and orientation or angle of the Device.

The CS is made of two surfaces, and each of the surfaces having at least two contacts. For convenience the stationary surface will be referred to as the "Base" and to the other

as the "Adapter" but this choice of wording is arbitrary and does not imply any preferred embodiment or limit the possible embodiments of the present invention.

When the two surfaces are put together (typically the adapter on top of the base, their relative position can be expressed as a tuple of three numbers <X, Y, G> called the 'relative placement' or "Placement" in short. The X and Y values denote the linear displacement between the centers of the two surfaces in the X and Y axis respectively. The G value denotes the relative radial angle in degrees between the two surfaces as projected on the X,Y plane with some arbitrary relative rotation considered to be of zero degrees.

A Placement is said to be 'supported' or 'active' by an embodiment of the present invention if a closed electrical circuit can be formed between the Base and the Adapter through the contacts of the Base and the Adapter. In a preferred embodiment, the set of active Placement forms a continuous range without gaps but this characteristic depends on the application in which each embodiment is used.

Fig. 2 shows a simplified view of an adapter placed on a base, forming a CS. The Base and the Adapter surfaces each has at least two contacts whose count, sizes, shapes and spacing and arrangement are determined such that in each Placement that is the active range of the coupler, there is at least one pair of contacts A1 and A2 of the Base and at least one pair of contacts B1 and B2 of the Adapter such that

1. Contact A1 of the Base touches contact B1 of the Adapter;
2. Contact A2 of the Base touch contact B2 of the Adapter;
3. The contacts of the Base and the Adapter do not form a short circuit between A1 and A2.

A careful review of these conditions shows that when these conditions are met, a two-wire electric circuit can be formed between the Base and the Adapter using contacts A1-B1 as one lead and contacts A2-B2 and the other lead.

The routing of the current to the proper pair of contacts for each Placement can be done in many ways. In some embodiment, a sensing circuit detect a signal that is asserted by the Adapters to the Base contacts it touches and use this information to activate that Base contacts. In other embodiment the current can be redirected to the proper contacts by sensing the relative position of the two surfaces and using a predefined formula to determine which Base contacts to activate. In other embodiment, the Base can switch the power to a sequence of pairs of Base contacts until it senses the proper circuit is closed with the device. In other embodiment, the current routing can be done by mechanical switches that are activated by the surfaces based on their relative location. In yet other cases a spacing pattern can be selected, by which due to the distance of the contacts on the adapter and on the base, always a correct correlation can be guaranteed, by using a checker board style pattern for the base, e.g. Fig. 2. (only array shown) Also shows a "power source" connected to the base, without showing the above mentioned switching mechanisms for simplicity.

Other options are discussed later in this disclosure.

Fig. 3 shows an example of how a CS for a notebook might be implemented.

In this case the Coupler provides a wide range of movement in the X and Y directions and a 360 degrees freedom of rotation around the Z axis. The Base is the top surface of a desktop, the Adaptor is built in into a notebook, and the Adapter contacts are mounted on the bottom surface of notebook. They could be built in some cases, or an actual adapter pad with contact areas may be attached to the bottom side of a regular notebook and a wire may connect the notebook's regular charging port. The Base contacts in this

embodiment are arranged as an array of circle of radius R with horizontal and vertical spacing of D between any two adjacent contacts.

Other options are discussed later in this disclosure.

The Adapter in this example uses only two contacts, each is a circle of radius (R+D/2)*SQRT(2) and with a spacing of at least 2R.

A close examination of the design shows that in this embodiment, when the notebook is placed on the desktop at an arbitrary location and angle, two Base contacts A1 and A2 that satisfy the three conditions above can always be found. These two contacts can be used to close a circuit with the notebook through the two notebook contacts. It is clear that other spacing and contact sizes and placements may be used. For example, rather than just rows and columns, the base may have a honey-comb style interleaving arrangement, or long linear contacts etc.

Again, for help of understanding a "load" symbolizes the electric aspects of the notebook, and the "power source" that of a supply, which may be in some cases considerably more complex.

Powering

Figure 4 shows an example, in which the CS is simplified by eliminating the need to perform dynamic power switching to the Base contacts at the expense of providing a more limited active range of positions and rotational angles. The Base uses two large rectangular pads and the Base use two smaller round pads. This arrangement allows

limited linear movement in the X and Y axis and limited rotational movement around the Z axis.

In order to control power application to a multi-contact coupling system, preferably in the idle state, the contacts of the power supply are not energized. When a load is connected to the power contacts. a sensing unit in the power supply detects that load and switches the power to the contacts based on information and properties of the load. In one embodiment. the power is of a pre-defined voltage and polarity or frequency is engaged. In some cases, the power supply may sense various parameters such as operational status, identification, and power requirements from the load and perform authentication, authorization and compatibility checks and then provide power to appropriate contacts using the required voltage and polarity. In yet other cases, the power supply may be a surface with a plurality of exposed contacts and may power multiple loads, each connected to another set of contacts and each having a different voltage or character. In some cases, the apparatus will provide protection against short circuits and overloads when contacts of the power supply are connected and provide personal shock protection when touching exposed contacts when a valid load is not present. Fig 5 shows a simplified diagrammatical overview of such a system. The power supply unit receives typically power from a standard household current supply, but in some cases may also use other sources, such as generators, solar panels, batteries, fuel cells, each separately or in any combination. On the other side, a multitude of contacts are shown as known to the inventor to exist in a Coupling System (CS). In the current art, the contacts of a power supply provide voltage in a preset voltage, frequency and polarity, independent on the actual load attached to it. In the present invention, the power supply detects when, where and how the load is connected to the power contacts, and may sense information such as identification, product type, manufacture, polarity power requirements, and other parameters and properties of the load and the connection, and uses this information to connect the power to the powered device thus, yielding several new benefits such as the

ability to perform authentication and compatibility checks before providing the power, adapting the voltage and polarity to the needs of the specific load, improving safety by avoiding exposed power connectors when no load is attached and the ability to power plurality of loads at the same time, each connected to an arbitrary set of contacts and receives a different voltage. This exchange or negotiation is symbolized by the arrows at the bottom of fig 1. labeled "ID, Status, Info" for the information provided by the device, and "power" for the resulting power applied to the correct set of contacts of the CS.

Fig. 6 shows a simplified overview, where for simplicity only the connected pair of the multitude is shown. It is clear to the artisan in the field, that more contacts can be managed, by first scanning for the presence of a device using more switches, and that those may be combined or may be separate from the polarity and voltage switches. Further advanced semi-conductors may be used, rather than simple mechanical or relay type switches, as indicated here for simplicity. The voltage and the polarity of the voltage are adjusted automatically to match the needs of the load.

When the two contacts of the load are connected to the two contacts of the power supply respectively, the sensing unit of the power supply detects the unique identifier of the unit ("ID") of the load through the connections and uses this ID to determine the voltage and current requirements of the load and the polarity in which it is to be connected. If the voltage and the current requirements are in the range supported by the power supply, the sensing unit sends a signal to the switch unit to power source in the right polarity and sends a signal to the power source to set the required voltage. This sensing is done by applying a minimal, non destructive sensing voltage or pattern, and observing responses of the ID element. That ID element may be as simple as a resistor, being read with a very low voltage below the activation of the normally non-linear response of the device load. In some cases it may be a diode, or a resistor and a diode in

any combination or any passive or active circuit, even inductors and capacitors can be used to convey presence and parameters to the base. In yet other cases, a digital ID may be used, and read, with a voltage that is below the active region of the load or, in some cases, the adapter can have intelligence to disconnect the load until it establish a connection or gets power from the base, this may be useful for example for resistive loads.

When the load is disconnected from the contacts, the sensing unit detects that the device bearing the ID is not connected to the power supply and turns off the switch unit, thereby disconnecting the power from the contacts. In some cases, the power base may disconnect on sense of the device current usage pattern.

Fig. 7 shows now a simplified system with multiple contacts, as shortly discussed above. It can provide power in two predefined voltage levels (V1, V2), and can power multiple devices in arbitrary combination of the two voltages requirements while automatically adapting the power polarity for each device. It is clear to person skilled in the art, that rather than having a number of fixed voltage rails, for example two programmable rails may be used, and the parameters reported back from the ID device may help select the voltages.

The power supply contains two power sources, one of voltage V1 and one of voltage V2. When the sensing unit detects that identification unit id1 is connected between power contacts C1(+) and C3(-) and activate the switches of contacts C1 and C2 to connect C1 to the (+) side of power source V1 and connect C2 to the (-) side of power source V1. In a similar way, the load L2 is connected to the voltage source V2 in the correct polarity through power contacts C2 and C6.

The sensing unit will typically be using a micro controller and some adaptation circuitry, including resistors, diodes, capacitors and possibly active components as well. Also, not shown are the supply to the sensing unit itself. As mentioned above, the control switches may be solid state or relays etc.

System

Combining the above-described elements into a complete system allows the user to have more freedom when using a notebook computer, for example, at a desk or similar prepared type of environment, such as a home office, a hotelling situation in a corporate environment, or even at a kiosk in an airport or other public place.

Figure 8 shows a desk 801 on which a desk mat 800 is placed. The desk mat is built according to the descriptions mentioned above. In the future, in some cases such a desk mat may be integrated into a part of the desk surface, rather than being a separate mat, but for the near future it will be easier to replace regular desk mats with these conductive types of desk mats.

Further, by using different techniques, the appearance may be changed dramatically. For example, a conductive plastic may be applied in a thin layer on top of a metallic conductor interleaved with non conductive material surrounding both the conductive plastic and metal. In other cases, metallic areas may be silk-screened with color, leaving sufficient openings for contact. In yet other cases, acidic etching into the metal may create openings to deposit colored resin, similar to anodizing of aluminum. In yet other cases, chrome-plated or nickel finished round metal spots may be embedded in a black rubber mat, for creative design. All these approaches can be used to make a desk mat product to be visually appealing to consumers, but essentially do not diverge from the invention disclosed here.

Cabling system 803 is hidden away behind the desk through an opening and connects to a power supply unit 802 that contains both the power source itself and the sensing and switching capability as described above. Power cord 804 with power connector 805

plugs into a regular household ac outlet, of the type available in normal homes and offices.

Figure 9 shows one case, in which the Adaptor Piece as attached to a notebook 900. The notebook is shown from the lower rear, with a view of notebook base 902 and notebook lid 901, which is slightly open. Adaptor piece 910 is attached to the bottom of the notebook using, for example, hook-and-pile fastener or mounting tape, or any other suitable fastening method, including but not limited to screws, bolts, glue, cement, snaps etc.. Adaptor piece 910 has, in this example, three separate areas 911, 912, and 913, wherein areas 911 and 913 may be conductive surfaces and area 912 is an insulator. Cable 920 plugs into the regular power supply of the notebook. Also shown is a wireless Ethernet card 930 protruding from the PCMCIA slot, a typical situation with notebook computers. In some cases, the adaptor may be an integral part of the notebook's enclosure, or in some cases more specifically also integrated with the battery or its enclosure, hence not requiring a special cable, or an attachment. Also, in case of a cable mentioned above, a convenience receptacle may be offered, so the user does not have to unplug the adapter piece in case of using a regular charger w/base. In some of these cases. the adapter may be electrically disconnected, as to avoid hazards by exposing hot contacts.

Figure 10 shows an overview of the notebook 900 placed freely on the desk 801 of Figure 8, as an example of a system setup. Notebook 900 is depicted as placed at an odd angle, to exemplify that such a device may, according to the novel art of this disclosure, be placed in any kind of position in this example on mat 800, allowing for the system to charge while the notebook is in use, without having to plug in any cables or carry any power supplies.

Many variations may be made to the system as presented herein without departing from the spirit of the novel art of this disclosure.

Contacts 911,912 & 913 of adaptor piece 910 may be round rather that square; its dimensions may match those of the notebook base, rather than being scaled to a functional minimal size, following the rules proposed earlier; adaptor piece 910 may

connect to a docking connector available on the bottom of some notebooks, rather than to the power cord. Or, in a preferred mode, adaptor piece 910 may be integrated into the standard enclosure of a notebook, eliminating the need for a separate, add-on device.

Desk mat 800 may also have many variations. It may be used in conjunction with a standard power supply provided by the notebook manufacturer and contain by itself only the sensing and switching functionality, rather than the full power supply.

In yet other cases, the system may also be used to transmit data over the established electrical connections, rather than just power. That may be achieved by either using additional contacts, as is proposed earlier, or by modulating the signal(s) onto the existing power leads, and adding a filter (i.e. inductor/cap) to separate the dc supply and the high speed data signals, such as Ethernet etc. In such cases, an Ethernet port may be offered on both the desk mat 800 (not shown) and a cable on adapter piece 910 (not shown). Other network standards besides Ethernet may also be supported, as desired or required by the market, both current and future ones. In some cases yet, wireless methods may be used for the data, such as optical including InfraRed (IR), inductive coupling, capacitive coupling, or radio frequency with or without some modulation techniques. That may include virtual docking connections or regular Local Area Network connections or both.

Many variations may be formed by shifting the partitioning or integration of features among various elements. In some cases, for example, the mat may be integrated into the desk; in other cases, it may be a foldable or rollable mat, reduced in size for easy portability, for the convenience of travelers. Further, in some cases input devices may be integrated in the base (e.g. a tablet or a large touch pad), the pad surface may be extra mouse friendly (both for mechanical and optical mice), or it may also be used to powering semi-mobile devices such as desk lamp or electric stapler etc. Additionally, there are advantages to ensure that the pad is an anti static pad (making it even safer than using no pad at all), or some of these extensions may be offered as modules, including making the pad area modular (cut to order, tiles, etc). In some cases, the base provides a standard power and each device/adapter converts it to the level needed by its respective device. Also, in some cases some information and sensing is done in the reversed

direction (base to device) and the device also makes some decisions or power switching (e.g. is that base safe for me).

Many other configurations and variations are also possible that do not depart from the spirit of the invention.

Small Geometry Solutions

Figure 11 shows a track system of interleaved plus and minus tracks. The plus tracks are numbered 1100 a, b, and c, and the minus tracks are numbered 1110 a and b. These tracks each have protrusions, similar nails or bolts, rising from the tracks themselves, numbered, respectively, 1102x and 1112x, and they are interleaved. These tracks could be embedded in an injected plastic or engraved wood surface, forming the pad 1101 shown here as a semivisible thickness aspect.

Figure 12 shows a top view. Again, a section of pad 1101 is shown. In this view, only three tracks are shown, creating an interleaving pattern of those rising conductor sections 1102x and 1112x, offset by half a grid from each other. The dots represent that those rising conductors (feeding points FPs) extend in both directions to whatever size is required.

Figure 13 emphasizes the interesting aspect of such a system as system 1200. Again, the FPs 1102 a-d are shown marked with a plus, and the dots 1112 a-c are shown with minus. FPs 1102 g-j are shown with plus; FPs 1112 g-i are shown with minuses.

Overlaying, in a transparent manner, is a contact pad 1300, containing three contacts. Each contact 1301, 1302, and 1303 is separate from each other contact, and may be used to feed a selection logic that determines which contact has been connected to a plus and which to a minus. In reality, a higher number of contacts such as 5 or more may be required to guarantee at least one contact to a plus FP and one contact to a minus FP, depending both on the geometry of the pad and the contact pad, as well as the contacts and FPs. For better clarity of the diagram however, only 3 are shown (in fact using this geometrical arrangement, it is easy to provide mathematical proof that even 4 contacts do not guarantee always one plus and one minus). The words Plus and minus are to be seen

in the broadest terms simply representing to conduits for power, since in some cases, rather than DC, AC may be used, or pulses, or power in conjunction with data etc.

The easiest way to achieve correct connectivity is to use a bridge rectifier to extract the voltage from the FPs and then use that voltage to drive the circuitry (not shown) between contact pad 1300 and a device (not shown), such as a notebook. The circuitry then, using low drop switches (i.e., bipolar solid state switches in parallel to the bridge rectifier), connects the actual contacts of contact pad1300 to the conductors of the notebook charger connector (details not shown).

It is clear that depending on the structure of the protrusions out of the plane (not shown) of the FPs and their sizes and distances between themselves, the contact pads and their contacts must be such that they cannot short between plus and minus FPs, on one hand; and that independent of the positioning on the surface, always at least one plus and one minus are connected.

In yet other situations, a complete rail may surface and depending on the dimensions and distances, the dimensions and distances as well as the geometry of the contact pad 1300 may change. In some situations, a linear array may be better or a T-shape or X-shape, or a honeycomb-cluster-of-contacts, or other suitable multi-port connection may be preferred or required over a basic kind of contact pad. A very suitable candidate seems to be a diamond-shaped contact pad, using four rather than just three contacts in conjunction with an interleaving field of round FPs as shown in Figure 13.

Depending on their sizes and geometry (for example, the FPs may be formed into diamond shapes, covering almost all of the surface with very tiny gaps for insulation, or a honeycomb pattern may be used, or just round dots as shown in Figure 13, or any other type of suitable geometry, and they may have protrusions, for example spherical, cylindrical with or without mitering, pokes etc), more than three or four contacts may be required to guarantee contact to a pair of FPs with opposite polarity to a pair of contacts on the contact pad, with shorting any FPs. A suggested approach to evaluating suitable geometries is model their connectivity by either a computer simulation or a mathematical formula. In many cases, the design of the Fps on the pad will be driven by Industrial

Design, and will necessitate all the other dependencies to follow suit.So many different variations are possible that stay within the scope of the invention that it is impossible even to list all the examples, but essentially they all end up doing the same. In some cases, it may be preferable to arrange the contact pad across the whole geometry of the portable device, rather than across only a localized group, thus allowing the weight to distribute across all contacts, ensuring a better electrical contact, rather than having all contacts of the contact pad in one corner, which might lift some of them off, unless they are spring loaded or the pad is pivotally mounted. In some other cases, the contacts may be integrated again in the enclosure of the portable device itself, with internal connections. In some cases, power may be always on to such a pad, and no sensing may be done at all, or only basic short circuit protection may be provided.

Figure 14 shows another example of a pad 1101 whose microstructure has been sectioned into sections 1401 a-n. For example, the plus of each section could be connected separately through a cable 1410 to adaptive power supply 1420, and the minus throughout the whole pad can stay connected so it is always on.

In such an example, once a device is deposited, only that section containing the device may be activated. Thus different sections of the pad could have different voltages, allowing the device not to require a regulator on the adaptor piece. So a user could then place a cell phone, laptop computer, and PDA all onto surface 1101, and the adaptive power supply would, after identifying each device, turn on either a standard voltage or a voltage specific to each device, depending on whether the devices have voltage adaptors themselves or have only identification switching devices.

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Various Ultimate Apparatuses and Methods for Implementing a Wireless Power Supply System

Figure 15 shows pad 1500 made of either conductive or nonconductive material, which has some thickness to it. Inside the pad is an inductor 1501 that can be positioned by moving arms 1510 and 1520, using, in this example, screwdrive mechanism 1511 and motor 1512 for arm 1510, and likewise screwdrive mechanism 1521 and motor 1522 for

arm 1520. Other mechanisms, such as belt drives, scissor arms, etc., may be used in lieu of this example screwdrive and motor arrangement.

Notebook 1542 has a matching inductor 1502 that may contain some circuitry. A cable 1503 comes out of the circuitry and enters the notebook 1542 standard charging circuit. In some cases, inductor 1502 may be integrated into the notebook.

As the notebook 1542 is placed on the surface of pad 1500, the controlling motors 1512 and 1522 (not shown for reasons of simplicity) are activated, for example by a command, pushing a button, weight detection, or other, similar means (described in more detail later) to detect the position of the notebook 1542 and the location of inductor 1502. This search can be performed by a controller, which may be embedded in the pad 1500 (not shown), or may be part of the power supply (also not shown), or may in some cases be controlled by the notebook itself, sending data to a small controller/receiver unit (also not shown). By scanning the surface of the pad, said controller aided by motors 1512 and 1522 can detect an area (i.e., a "sweet spot") where optimal or near-optimal coupling may be achieved, thus deducting that inductor 1502 is located on the pad surface above.

In some cases, inductor 1502 may send out a homing signal that may be used to track the location of notebook 1542. In other cases, inductor 1501 may send out a ping signal and listen for some kind of resulting echo response from inductor 1502. In yet other cases, as described also further below, other sensor types or optical detection can also be used to guide the search for the sweet spot.

Once the sweet spot area has been found, small-step increments allow positioning the inductor more accurately, and hence allow the power to be increased once satisfactory magnetic coupling is achieved. If the user were to move notebook 1542, the magnetic coupling quality would fall, which could be observed by the adaptive power supply, resulting in shutting off the power and initiating a new search sequence, reconnecting the notebook to charging again.

Figure 16 shows a different approach using an array of inductors 1601 a-n embedded in a pad 1600, which may be either conductive or nonconductive, each separately

connected to a controller 1602, which then is connected by a wire 1603 to a power supply. Notebook 1642 has a larger inductor, 1612 that, in any situation, should include at least one or several instances of inductor 1601 a-n, but in some cases it may have also several inductors with or without electronic switching. Depending on the geometries of the positions of 1601a-n and the receiver coil 1612, power can then be turned on to one or more of the inductors 1601 a-n, thus improving coupling between the receiving coil 1612 and the emitting coils of inductors 1601 a-n.

In yet another approach, Figure 17 shows a capacitive coupling system. Pad 1700, which may be either conductive or nonconductive, although non-conductive is preferred, is divided into an array of electrodes 1701 a-n. Notebook 1742 has two distinct surfaces 1712 a and b, which are connected to a power receiving unit 1714. Said unit 1741 is, in turn, connected to a cable to a power adaptor plug of notebook 1742.

Figure 17b shows that, based on determination of the notebook position, the electrodes 1701 x1 and x2 are selected from available electrodes 1701 a-n, forming a capacitive transformer with notebook electrodes 1712 x1 and x2. Hence power is fed into power preparation circuitry 1714, and then connected by cable 1715 to notebook 1742.

In some cases, the pad can also be a combination, that is, one 'wire' is conductive (e.g. ground) and the other is capacitive.

Figure 18 shows a few alternative methods for activation and determination of location of the notebook. For example, pad 1800 (which may be a conductive or nonconductive pad, according to any of the methods described above) is partitioned into sections. Each section 1801 a-n may contain a sensor element 1811 a-n. In some cases, this sensor element may be a photo sensor. In other cases, it may be a simple mechanical pressure switch. In yet other cases, it may be a piezo pressure or weight sensor, etc.

According to data obtained by the sensors, the position of a device may be determined, and, using information such as weight and footprint, in some cases even the device ID may be sensed.

In yet other cases, the piezo sensors may pick up ultrasonic signals emitted by the notebook, or said sensors may ping the notebook, which then responds with an echo giving its location and type.

Alternatively, a camera 1821 may take a picture of pad 1800 and see a device deposited on said pad. Image recognition means associated with the camera may recognize the model and type of the device, as well as its orientation, and may instruct the adaptive power supply or one of the nonconductive systems, to activate power accordingly.

In yet another implementation, a voice recognition system 1832 may have a microphone 1831 connected to it. The user may then simply say, "Please charge my Sony™ notebook," and accordingly, the voice recognition system would instruct the adaptive power supply or the nonconductive pad to turn on power.

In yet other cases, RF triangulation from an 802.11x type network, GPS, or other, similar means, may be used to locate the device and determine whether it is situated on a pad and thence activate that pad (not shown) accordingly. Or in some cases, a button may be provided on the pad itself or on the device that the user has to push to initiate the charging, rather than using automatic initiation of charging. Such a manual initiation of charging would avoid unintentional charge cycles.

In yet other cases, a pad deploying a conductive surface with openings may be placed above another solid conducting surface, separated by an insulating layer with slightly smaller openings (not shown). Ball-like contacts may be spring loaded and protrude from the bottom of a mobile device, some of which will "land" in holes and connect to the lower plane carrying one polarity, the others resting on the top one, connecting to the top layer carrying the other polarity, hence again creating a situation where power can be sent up to a device, without having to plug in any connections, and still maintaining some freedom to move the device.

In yet other cases the current can be redirected to the proper contacts by sensing the pressure exerted by the device on the base. Once a device is atop the base surface,

pressure inside the surface determines the location of the device and routes power to the appropriate location.

In yet other cases the current can be redirected to the proper contacts by using optical sensors. Certain sensors embedded on or away from the base could detect an optical signal, such as infrared, generated by the adapter. Based on a formula dependent on the optical signal, the base can redirect power to the proper contacts. In certain embodiments the optical signal may be generated at the base or away from the base and received by the adapter.

In certain embodiments the adapter may be connected, attached, or built into the side of the laptop or mobile device. In the event the adapter is united to the side of the mobile device, the adapter would contain contacts that connect to the bases' contacts. In yet other embodiments, the adapter may be attached to the top of the device or the screen of the laptop. In such cases, when the laptop screen is fully open the power could transfer from the contact on the base surface to the adapter on the laptop or the mobile device.

Many other approaches may be used to mimic the same method and apparatus, even if some of the details are modified so they do not exactly match the examples presented herein.
